

ecobETON®
TOTAL CONCRETE PROTECTION

Welcome to Ecobeton CPD

Introduction to Concrete Durability and Protection



Key Learning Points

- Factors affecting concrete durability
- Common causes of degradation
- Importance of concrete protection

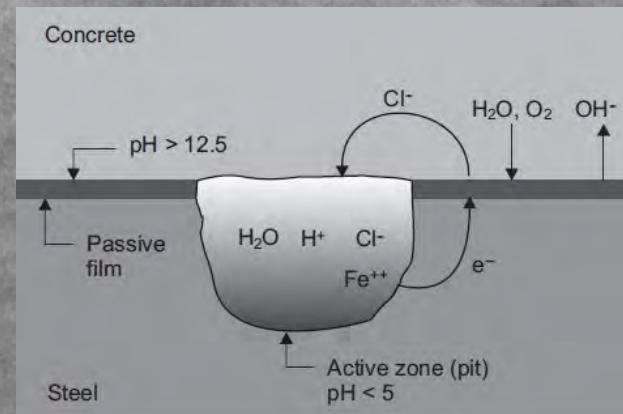
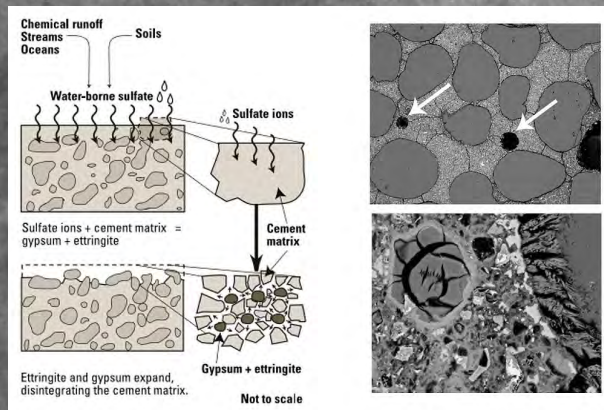
Physical Factors Affecting Durability

- Freeze-thaw cycles
- Abrasion and mechanical wear
- Other environmental factors



Chemical and Environmental Factors

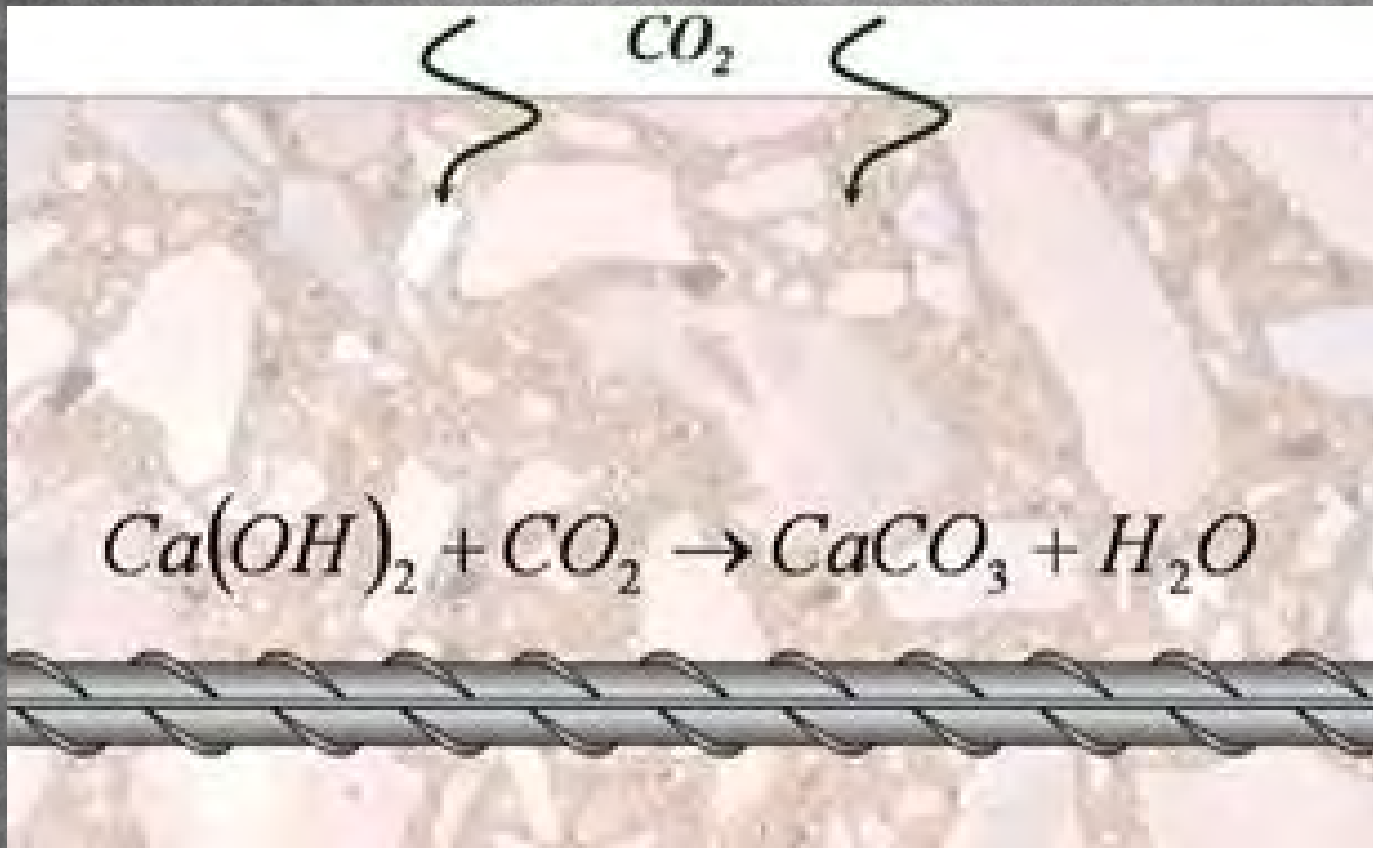
- Sulfate attack
- Chloride ingress
- UV exposure, water ingress, temperature fluctuations



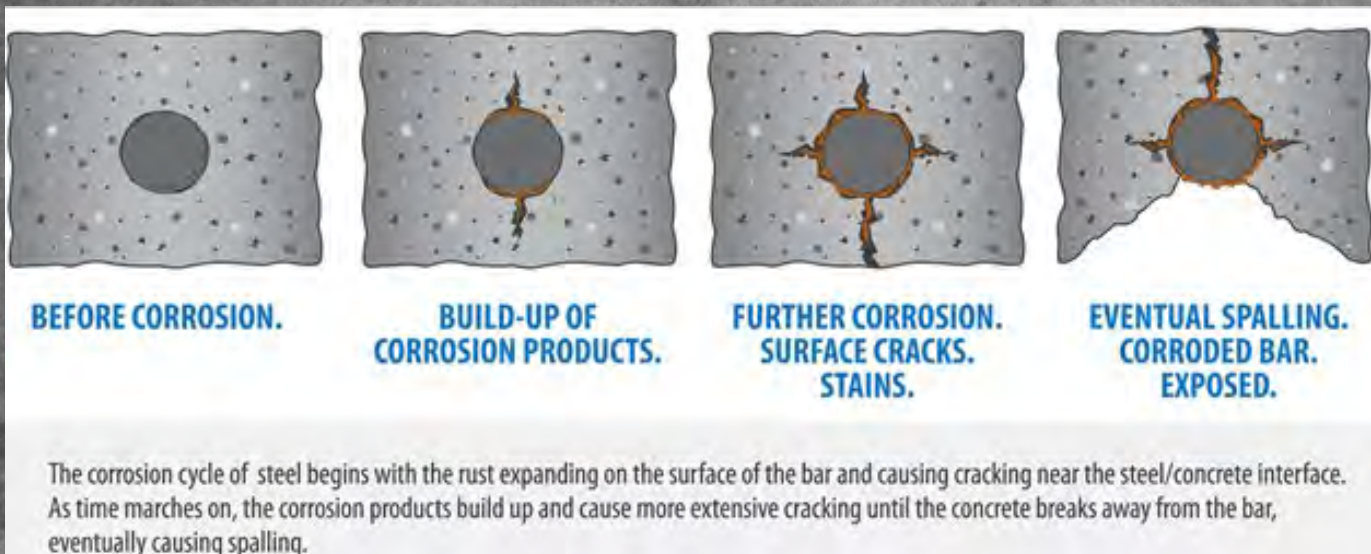
Common Degradation Mechanisms

- Carbonation
- Chloride-induced corrosion
- Sulfate attack

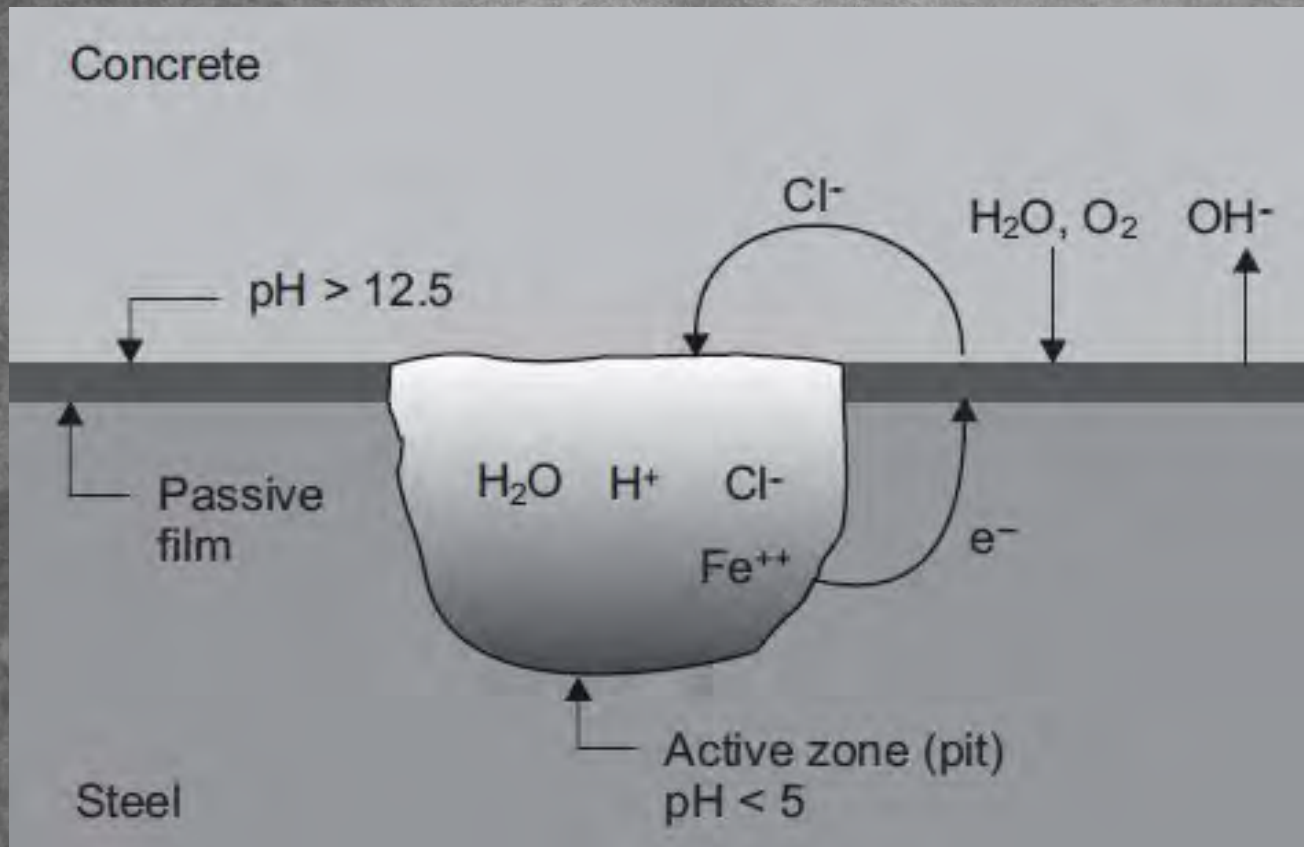
Common Degradation Mechanisms



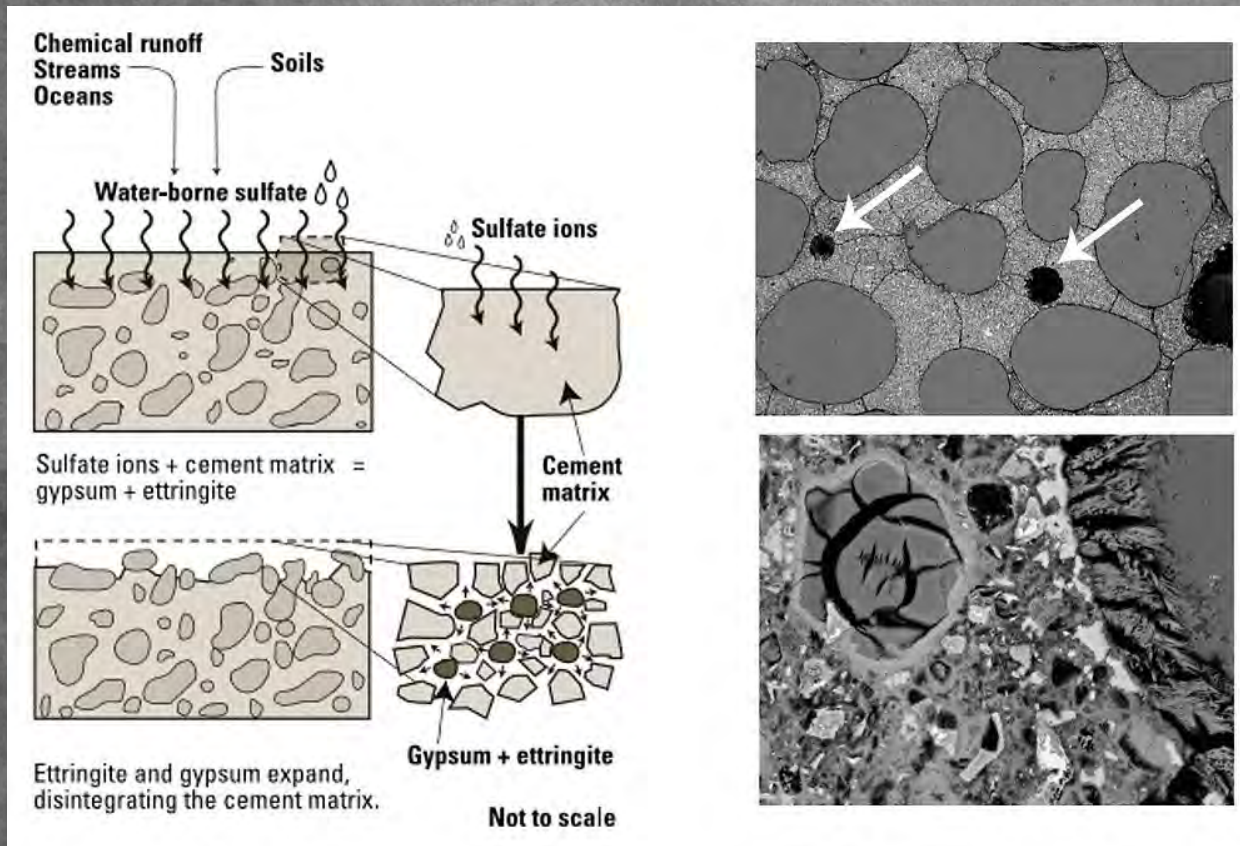
Common Degradation Mechanisms



Common Degradation Mechanisms



Common Degradation Mechanisms



The Importance of Concrete Protection

- Preventative measures vs. repair costs
- Long-term durability benefits
- Cost-effective solutions



Interactive Q&A

- Share your experience with concrete durability challenges
- What measures have you taken to protect concrete in your projects?

The Role of Silicates in Concrete Protection



Silicate Chemistry and Reaction with Concrete

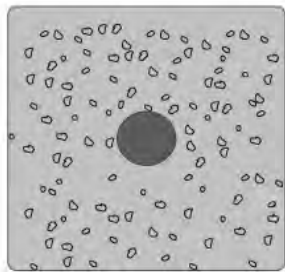
- • Silicates react with calcium hydroxide
- • Formation of calcium silicate hydrate (C-S-H)
- • Pore filling and permeability reduction

Moisture Ingress and Protection

- • Silicates form a deep chemical barrier
- • Reduces water ingress and chloride penetration
- • Ideal for high-moisture environments

Chemical Resistance and Long-Term Durability

- Reduces sulfate attack and carbonation
- Limits chloride penetration
- Increases overall durability and lifespan

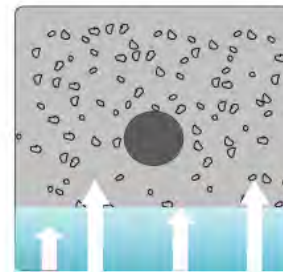


Evercrete Vetrofluid

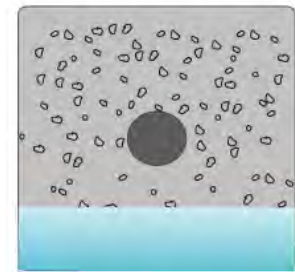
Spray application of Evercrete Vetrofluid.



Evercrete Vetrofluid crates a barrier that repels water and carbon dioxide.



Evercrete Vetrofluid lets the concrete breathe allowing the passage of oxygen.



Evercrete Vetrofluid maintains the concrete consolidated and intact.

Why Choose Silicates Over Other Protection Methods?

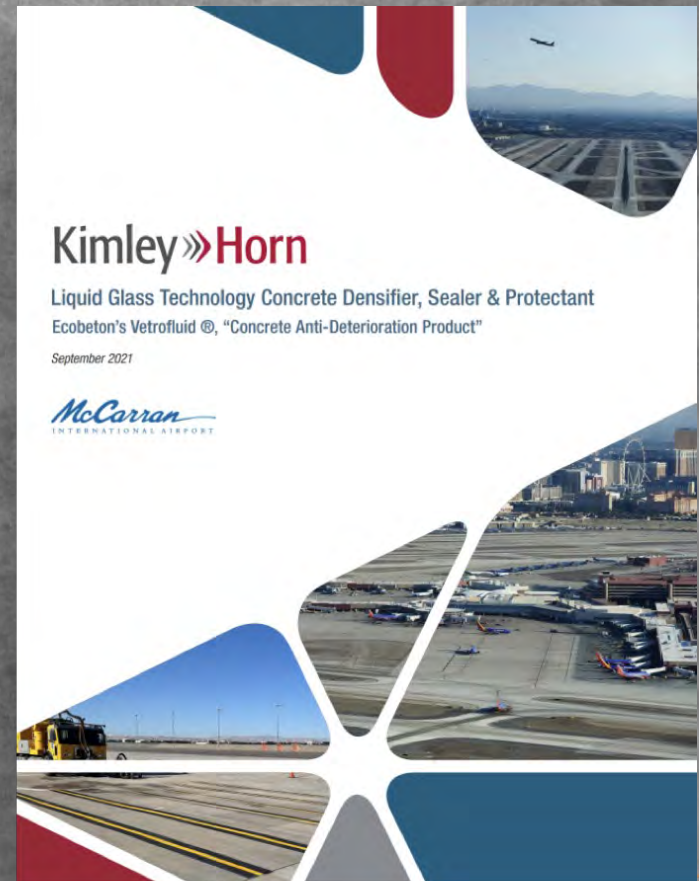
- • Permanent protection via chemical bonding
- • Vapor permeability and ease of application
- • Cost-effective and long-lasting
- • Ease of application



Case Study: Ecobeton's Vetrofluid

- • Deep penetration into concrete
- • Protects against water and chemical ingress
- • Used in bridges, tunnels, and commercial projects

Recommended by Kimley Horn



Interactive Q&A and Discussion

- • How have you protected concrete in your projects?
- • Have you used silicate-based treatments before?

Silicates as Curing Agents

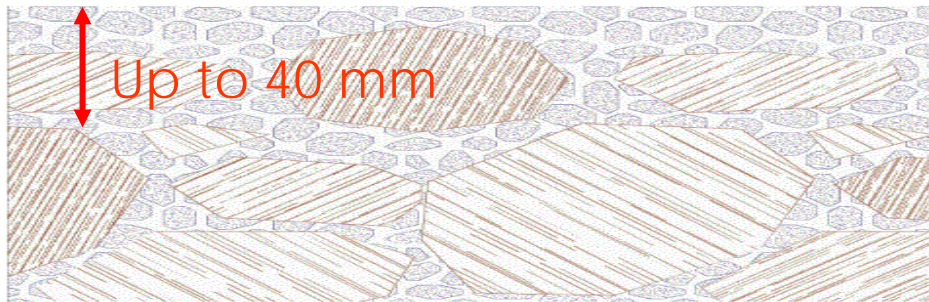


The Role of Curing in Concrete Development

- • Curing ensures strength development and crack prevention
- • Prevents moisture loss, which leads to shrinkage and reduced compressive strength

Silicate-Based Curing Agents and How They Work

- Silicates form a surface layer that helps retain water
- They densify the concrete by forming C-S-H, enhancing hydration



Physical and Chemical Benefits of Silicates in Curing

- • Improved water retention
- • Reduced surface cracking
- • Denser concrete and reduced shrinkage



Concrete was placed and cured with only Vetrofluid after finishing. Within the first 4 hours of curing time a very tight micro surface crack showed on the surface and the sides in line with the transition line between the 17 inch section and the 4 inch section. This crack has not increased or changed in the last 5 months and no further cracks have been identified.

Benefits using Vetrofluid as a curing compound is that it allows the surface to gain additional strength (Based on the beam strength tests below) quicker than typical cure compound. This additional strength should increase the life span of the PCC surface.

From the Kimley
Horn report

Long-Term Benefits of Using Silicates in Curing

- • Better durability and compressive strength
- • Reduced maintenance costs
- • Improved long-term performance

Interactive Q&A and Discussion

- • Have you used silicates for curing before?
- • How do you typically approach the curing process in your projects?

Comparative Analysis of Silicate-Based Products



Types of Silicate-Based Products

- • Sodium silicates: Common and cost-effective
- • Potassium silicates: Higher chemical resistance
- • Lithium silicates: Superior penetration and durability

Performance Comparison of Sodium, Potassium, and Lithium Silicates

- • Permeability reduction
- • Strength enhancement
- • Chemical resistance and durability

Case Studies and Applications

- • Example 1: Sodium silicate for industrial floors
- • Example 2: Potassium silicate in harsh chemical environments
- • Example 3: Lithium silicate for long-term protection

Case Studies and Applications

Case Studies and Applications



Case Studies and Applications



Interactive Q&A and Discussion

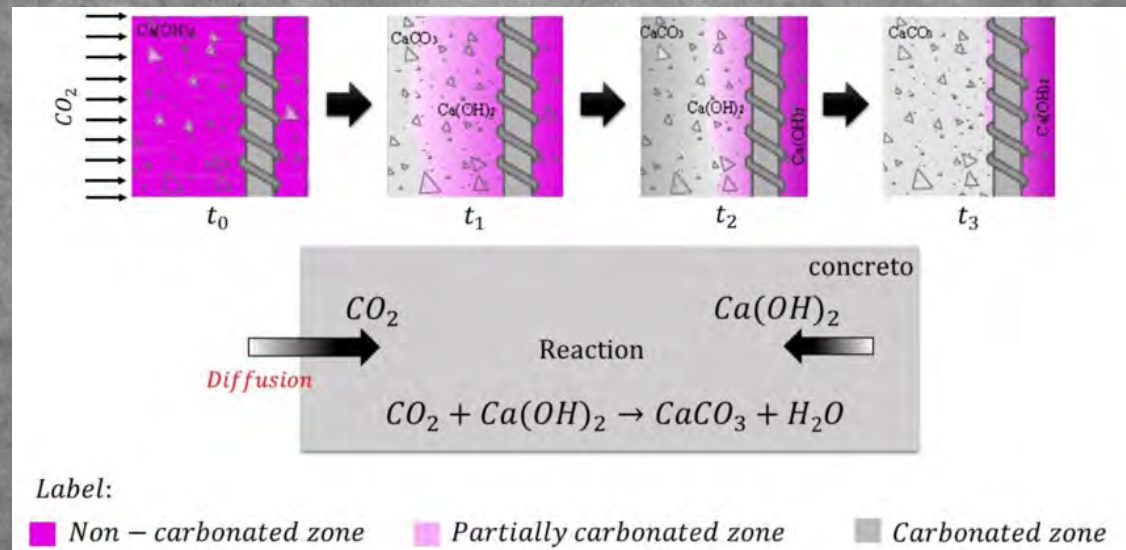
- • Which silicate products have you used?
- • How do you select silicates based on project needs?

Carbonation Resistance



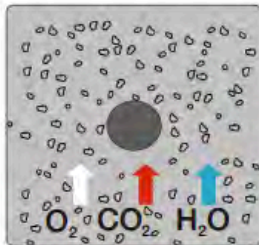
The Carbonation Process

- CO_2 reacts with calcium hydroxide in concrete
- Formation of calcium carbonate reduces pH
- Lower pH leads to corrosion of steel reinforcement

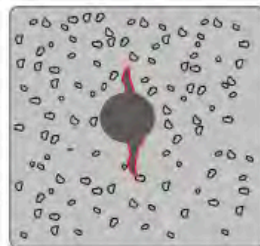


Impact on Concrete Durability

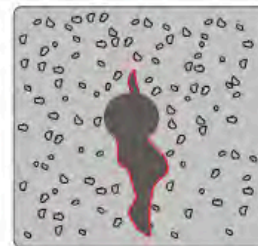
- • Loss of alkalinity compromises steel reinforcement
- • Increased susceptibility to corrosion
- • Reduced structural integrity



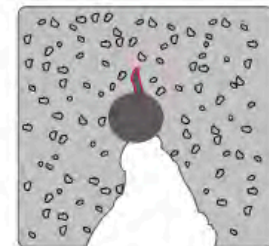
Untreated concrete is attacked by elements such as water, oxygen and carbon dioxide, that trigger the carbonation process.



The rebar oxidises starting to cause fissures.



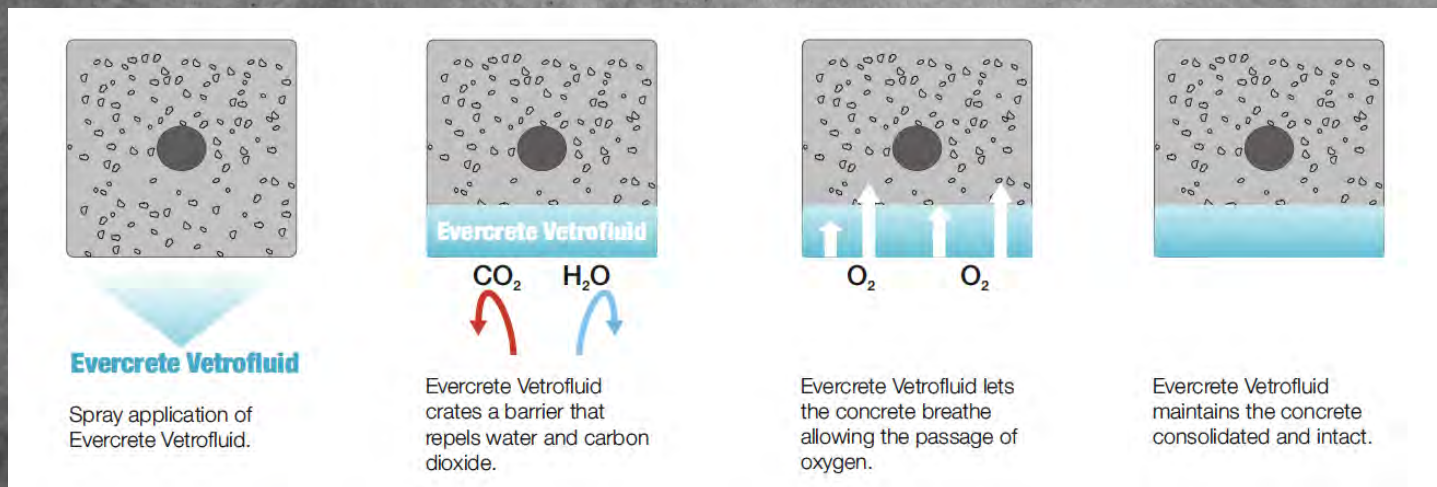
The fissures increase in volume due to the expansive reaction of iron oxide, involving the entire concrete cover.



Due to the internal tensions caused by the oxide expansion, the concrete cover is expelled.

Mitigating Carbonation with Silicate-Based Treatments

- Silicates densify the concrete and slow CO₂ ingress
- Helps maintain pH and protects rebars
- Increases durability and longevity



Case Studies and Applications

- • Example 1: Mitigating carbonation in high-rise buildings
- • Example 2: Preventing carbonation in bridge decks
- • Example 3: Application in marine environments

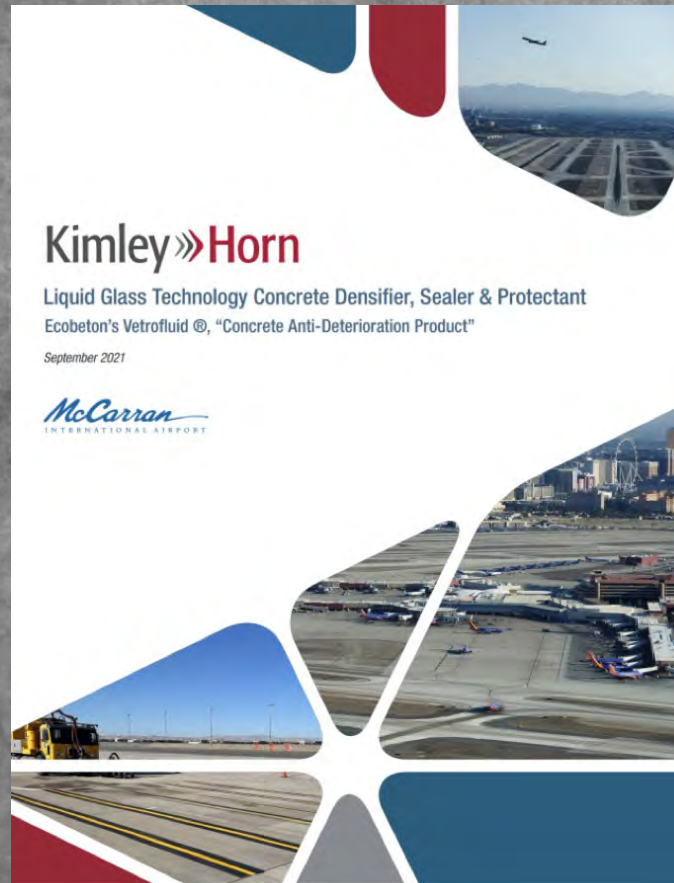
Case Studies and Applications



Interactive Q&A and Discussion

- • Have you encountered carbonation issues?
- • How could silicate treatments be applied to your projects?

Case Studies and Practical Applications



Case Study 1: Infrastructure – Bridges and Tunnels

- • Silicate treatments for chloride ingress and carbonation
- • Improved durability and resistance in harsh environments



Calvene bridge - Cosfara (IT)



Mezzolombardo tunnels (IT)



Rudavoi bridge - Cortina (IT)

Case Study 2: Commercial and Residential Buildings

- • Moisture protection and longevity in urban high-rises
- • Application of silicates for enhanced surface durability



Victoria Apollo Theatre

Façade restoration and protection



Case Study 3: Industrial Applications

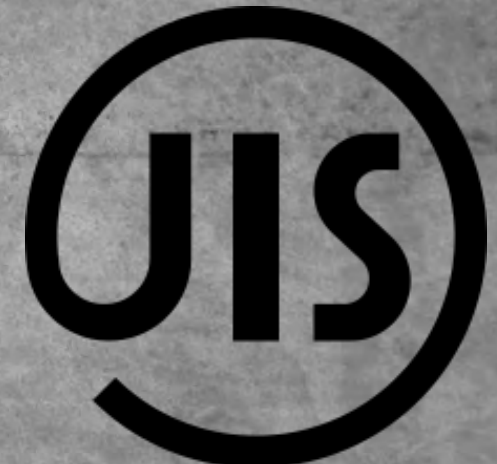
- • Resistance to chemicals and heavy wear in industrial settings
- • Protecting concrete floors and structures with silicate treatments



Interactive Q&A and Discussion

- • How could these case studies inform your future projects?
- • What challenges have you faced with silicate applications?

Industry Standards and Compliance



EUROPEAN NORM



Key Industry Standards

- • ASTM, BS, and EN standards
- • Focus on curing, protection, and silicate application
- • Ensuring product and process compliance

Importance of Compliance

- • Ensures long-term durability and performance
- • Minimizes liability and ensures project success
- • Non-compliance can lead to structural failure

Real-World Examples of Compliance and Non-Compliance

- • Case studies of compliance ensuring durability
- • Examples of non-compliance leading to concrete degradation and failures

Real-World Examples of Compliance and Non-Compliance

- **Case Study: Crossrail (Elizabeth Line)**

**Compliance to National Standards:
British Standards for Concrete Durability:**



BS EN 206-1:2013 (Concrete: Specification, performance, production and conformity)
BS 8500 (Complementary British Standard to BS EN 206, specific to UK conditions)

- BS 8102:2009 (Code of practice for protection of below-ground structures against water from the ground)

The Crossrail project is expected to have a design life of 120 years. Through adherence to UK national standards and the use of advanced materials, the project has mitigated risks associated with carbonation, chloride ingress, and water penetration, ensuring the long-term durability of the infrastructure.

Real-World Examples of Compliance and Non-Compliance

Case Study: Ronan Point, London

Non-Compliance to National Standards:

- - Non-Compliance with Design Standards
- - Non-Compliance of Quality of Concrete Materials
- - Lack of Adherence to Safety Standards

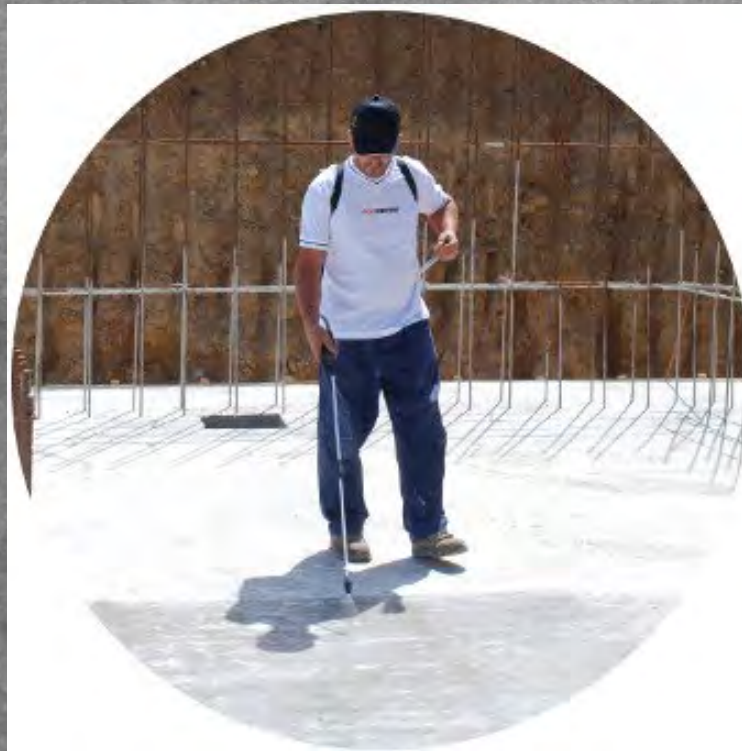
The Ronan Point building collapse is a tragic example of how non-compliance with construction standards and poor-quality concrete materials can result in the degradation of the structure and eventual failure. This disaster had a lasting impact on UK building regulations and reinforced the importance of adhering to concrete durability and design standards to prevent similar failures in the future.



Interactive Q&A and Discussion

- • What standards do you follow in your projects?
- • What are the challenges in ensuring compliance?

Best Practices for Using Silicates



Surface Preparation

- Proper cleaning ensures silicate penetration
- Remove contaminants like oils, dust, and debris
- Methods: pressure washing, abrasive blasting

Timing of Application

- • Apply during curing or after surface hardening
- • Ideal conditions: moderate temperature and humidity
- • Timing ensures full penetration and effectiveness

Application Methods

- • Spraying and rolling are most effective
- • Ensure even coverage and correct dosage
- • Avoid pooling or over-application

Avoiding Common Mistakes

- • Over-application or uneven coverage
- • Failing to clean or prepare the surface
- • Applying in inappropriate environmental conditions



Interactive Q&A and Discussion

- • Have you experienced challenges with silicate application?
- • What best practices do you follow in your projects?

Conclusion and Interactive Q&A



To summarize

Key Takeaways

- • Silicates play a vital role in curing, protection, and durability
- • Best practices ensure optimal performance
- • Silicate products enhance longevity and reduce maintenance

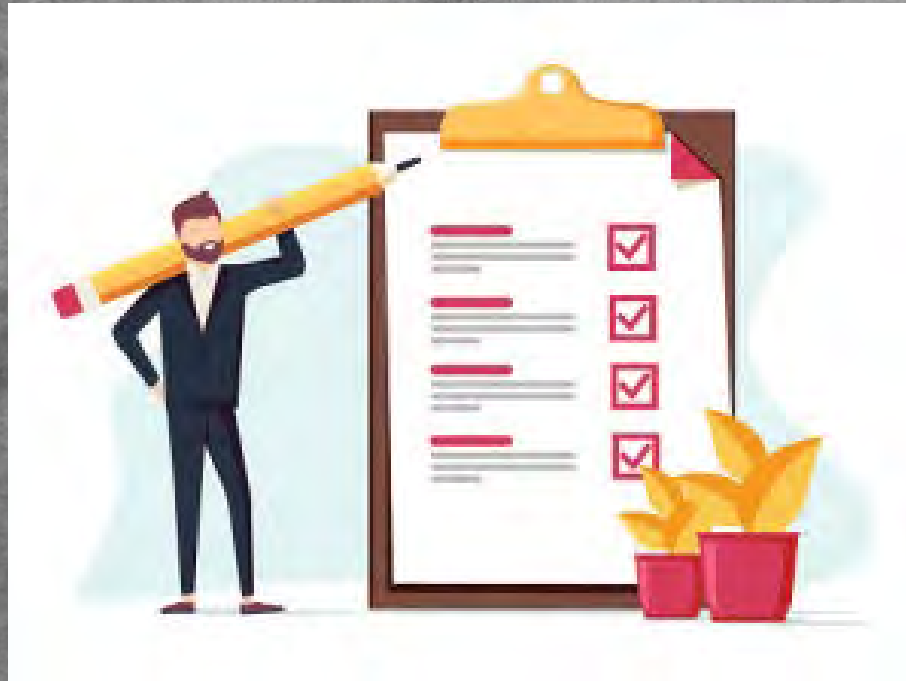
Application to Projects

- • Apply silicate products in curing and long-term protection
- • Address challenges in real-world construction scenarios
- • Tailor solutions based on project needs

Final Q&A and Discussion

- • Final questions on application and best practices?
- • How will you integrate these insights into your projects?

Assessment and Certification



Assessment Overview

- • Assessment covers key concepts: silicate chemistry, curing, protection, and best practices
- • Multiple-choice, short answer, or practical scenarios
- • Evaluates understanding of course content

Certification Criteria

- • Participants must achieve a passing score on the assessment
- • Active participation in interactive elements
- • Certification awarded upon successful completion

Certification Process

- • Certificates issued upon completion
- • Certification can be used for CPD credits
- • Ensure accuracy in completing assessment details

Certification Criteria

- • Any final questions on the assessment?
- • Clarifications on certification or CPD credits?

Thank you!

